

Name: \_\_\_\_\_

## Topic 2

### 2.1 Cell theory

Assessment Statement	Study information
2.1.1 Outline the cell theory.	List the 3 parts to the cell theory.
2.1.2 Discuss the evidence for the cell theory.	<p>Discuss the difference between a theory and a hypothesis.</p> <p>Identify 1 piece of evidence for the cell theory.</p> <p>Identify 1 exception to the cell theory.</p>
2.1.3 State that unicellular organisms carry out all the functions of life.	<p>Define each of the following functions of life and give an example of how a unicellular organism (such as a bacterium) performs them.</p> <p>Metabolism –</p> <p>Response to stimuli –</p> <p>Maintains homeostasis (think transport) –</p>

	<p>Growth –</p> <p>Reproduction –</p> <p>Nutrition –</p>
2.1.4 Compare the relative sizes of molecules, cell membrane thickness, viruses, bacteria, organelles and cells, using the appropriate SI unit.	<p>1 mm = _____ <math>\mu\text{m}</math>  1 <math>\mu\text{m}</math> = _____ nm</p> <p>Size of a protein – _____</p> <p>Thickness of cell membrane – _____</p> <p>Size of virus – _____</p> <p>Size of bacterium – _____</p> <p>Size of mitochondrion – _____</p> <p>Size of animal cell – _____</p>
2.1.5 Calculate the linear magnification of drawings and the actual size of specimens in images of known magnification.	<p>Magnification = _____</p> <p>Below is a scale bar from an electron micrograph. Please calculate the magnification of this micrograph.</p> <p>_____</p> <p>5 <math>\mu\text{m}</math></p>
2.1.6 Explain the importance of the surface area to volume ratio as a factor limiting cell size.	<p>Calculate the surface area to volume ratio of a 1cm cube.</p> <p>If a cell has a large volume, identify 2 processes it is performing at a higher rate.</p> <p>Identify 1 molecule is will need more of and how an increased surface area would benefit the cell.</p>

2.1.7 State that multicellular organisms show emergent properties.	<p>Explain emergent properties.</p> <p>Explain how multicellular organisms show emergent properties while unicellular organisms don't.</p>
2.1.8 Explain that cells in multicellular organisms differentiate to carry out specialized functions by expressing some of their genes but not others.	Explain differentiation. (Be sure to mention gene expression in your answer).
2.1.9 State that stem cells retain the capacity to divide and have the ability to differentiate along different pathways.	<b>We will discuss this in genetics. Skip for now!</b>
2.1.10 Outline one therapeutic use of stem cells.	<b>We will discuss this in genetics. Skip for now!</b>

## 2.2 Prokaryotic cells

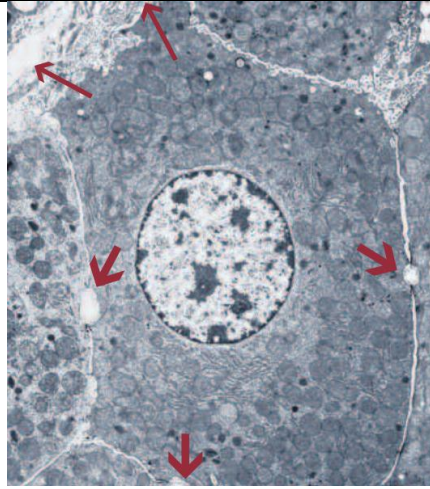
Assessment Statement	Study information
2.2.1 Draw and label a diagram of the ultrastructure of Escherichia coli (E. coli) as an example of a prokaryote.	Draw a diagram of an E. coli cell. Label the cell wall, plasma membrane, cytoplasm, pili, flagella, ribosomes, mesosome, and nucleoid (region containing naked DNA).
2.2.2 Annotate the diagram from 2.2.1 with the functions of each named structure.	<p>Describe the function of each of the organelles below.</p> <p>Cell wall:</p> <p>Cell membrane (plasma membrane):</p>

	<p>Cytoplasm:</p> <p>Pili:</p> <p>Flagella:</p> <p>Ribosomes:</p> <p>Mesosome:</p> <p>Nucleoid region:</p>
<p>2.2.3 Identify structures from 2.2.1 in electron micrographs of <i>E. coli</i>.</p>	<div data-bbox="532 835 672 1423" data-label="Image">An electron micrograph of a single, rod-shaped Escherichia coli (E. coli) cell. The cell is elongated and has a slightly tapered shape. The internal structure is visible, showing a darker, more electron-dense nucleoid region in the center, surrounded by a lighter cytoplasm. The cell wall and membrane are also visible as distinct layers.</div> <p>Label the cell wall, cell membrane, nucleoid region, and cytoplasm in the diagram above.</p>
<p>2.2.4 State that prokaryotic cells divide by binary fission.</p>	<p>Explain the process of binary fission using a diagram.</p>

## 2.3 Eukaryotic cells

Assessment Statement	Study Information
2.3.1 Draw and label a diagram of the ultrastructure of a liver cell as an example of an animal cell.	Draw a diagram of an animal cell. Label the cell membrane, free ribosomes, rough endoplasmic reticulum (rER), smooth ER, lysosome, Golgi apparatus, mitochondrion, cytoplasm, and nucleus.
2.3.2 Annotate the diagram from 2.3.1 with the functions of each named structure.	<p>Describe the function of each of the organelles below.</p> <p>Cell membrane:</p> <p>Free ribosome:</p> <p>Rough Endoplasmic reticulum:</p> <p>Smooth Endoplasmic reticulum:</p> <p>Lysosome:</p> <p>Golgi Apparatus:</p> <p>Mitochondrion:</p> <p>Cytoplasm:</p> <p>Nucleus:</p>

2.3.3 Identify structures from 2.3.1 in electron micrographs of liver cells.



Label the nucleus, cell membrane, cytoplasm, and ribosomes in the electron micrograph above.

### 2.3.4 Compare prokaryotic and eukaryotic cells.

List 4 differences between prokaryotic and eukaryotic cells.

List 2 similarities between prokaryotic and eukaryotic cell.

2.3.5 State three differences between plant and animal cells.

List 3 differences between plant and animal cells (remember these are both eukaryotic cells).

2.3.6 Outline two roles of extracellular components.

Outline the role of the cell wall in plant cells and/or prokaryotic cells.

Outline the role of the extracellular matrix in animal cells.

## 2.4 Membranes

Assessment Statement	Study Information
2.4.1 Draw and label a diagram to show the structure of membranes.	<p>Draw a cross section of the plasma membrane (cell membrane).</p> <p>Label the phospholipid bilayer, a cholesterol molecule, a glycoprotein, an integral transport protein and a peripheral protein.</p>
2.4.2 Explain how the hydrophobic and hydrophilic properties of phospholipids help to maintain the structure of cell membranes.	<p>Define hydrophobic.</p> <p>Define hydrophilic.</p> <p>Explain how the structure of phospholipids helps maintain the structure of the plasma membrane. (Use hydrophobic and hydrophilic in your answer).</p>
2.4.3 List the functions of membrane proteins.	<p>Explain the functions of membrane proteins below and give a specific example of each.</p> <p>Hormone binding sites (receptors):</p> <p>Immobilized enzymes:</p> <p>Cell adhesion:</p> <p>Cell-to-cell communication:</p> <p>Channels for passive transport:</p> <p>Pumps for active transport:</p>

3.4.4 Define diffusion and osmosis.	<p>Define diffusion.</p> <p>Define osmosis.</p>
3.4.5 Explain passive transport across membranes by simple diffusion and facilitated diffusion.	<p>Describe simple diffusion using a diagram.</p> <p>Describe facilitated diffusion using a diagram.</p>
3.4.6 Explain the role of protein pumps and ATP in active transport across membranes.	<p>Explain active transport using a diagram.</p>
3.4.7 Explain how vesicles are used to transport materials within a cell between the rough endoplasmic reticulum, Golgi apparatus and plasma membrane.	<p>Using a diagram, explain how vesicles are used to transport proteins between the rough ER, Golgi apparatus, and plasma membrane.</p>





<p>2.5.3 State that interphase is an active period in the life of a cell when many metabolic reactions occur, including protein synthesis, DNA replication and an increase in the number of mitochondria and/or chloroplasts.</p>	<p>Identify which of the processes mentioned in the assessment statement occur in G1 phase.</p> <p>Identify which of the processes mentioned in the assessment statement occur in S phase.</p> <p>Identify which of the processes mentioned in the assessment statement occur in G2 phase.</p>
<p>2.5.4 Describe the events that occur in the four phases of mitosis (prophase, metaphase, anaphase and telophase).</p>	<p>Describe with the help of a diagram the events that occur in –</p> <p>Prophase:</p> <p>Metaphase:</p> <p>Anaphase:</p> <p>Telophase:</p>
<p>2.5.5 Explain how mitosis produces two genetically identical nuclei.</p>	<p>Explain why daughter cells are identical in mitosis. (Use the term sister chromatids in your answer).</p>

2.5.6 State that growth, embryonic development, tissue repair and asexual reproduction involve mitosis.

Explain how each of the processes below use mitosis.

Embryonic development:

Tissue repair:

Asexual reproduction (of say amoeba for example):